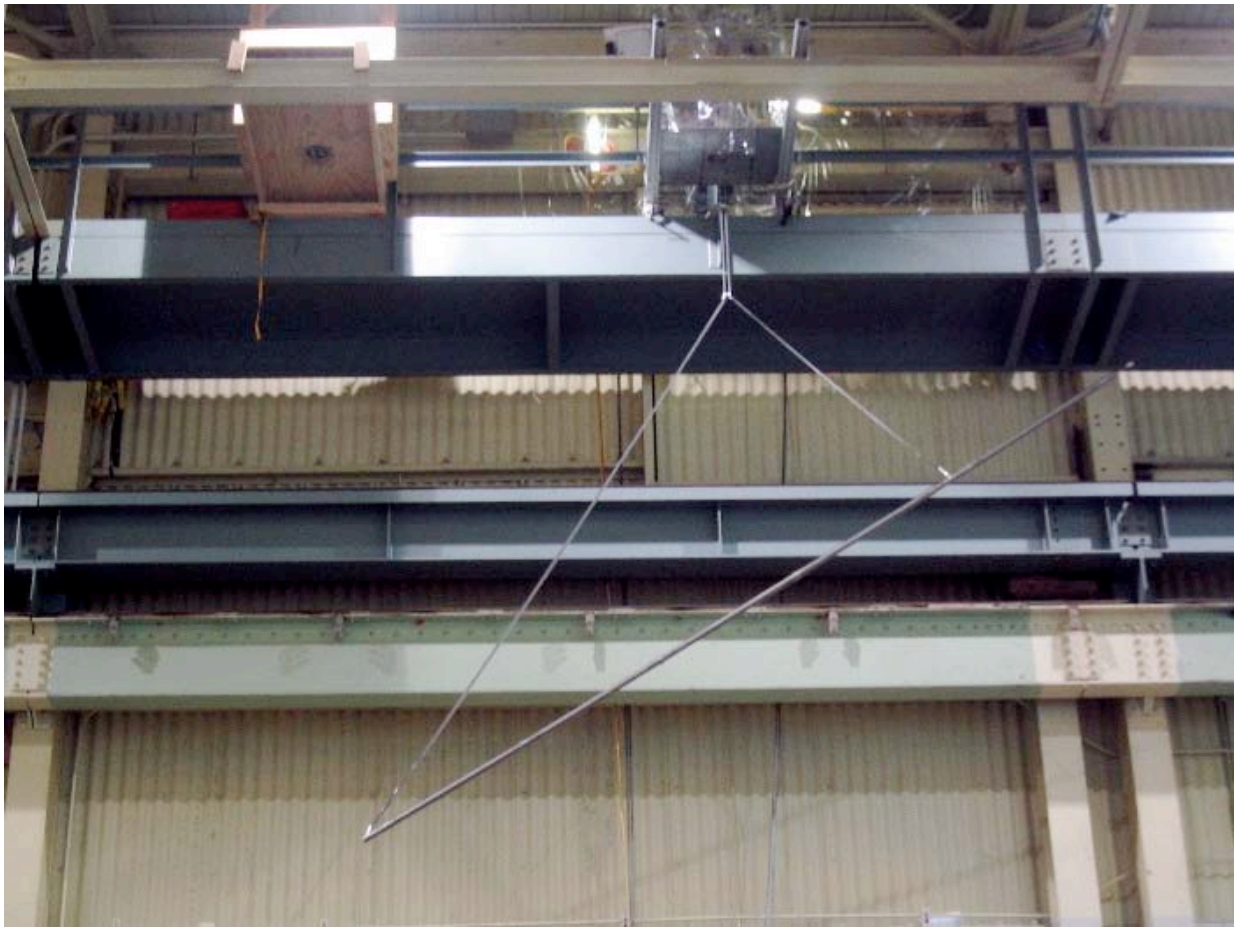
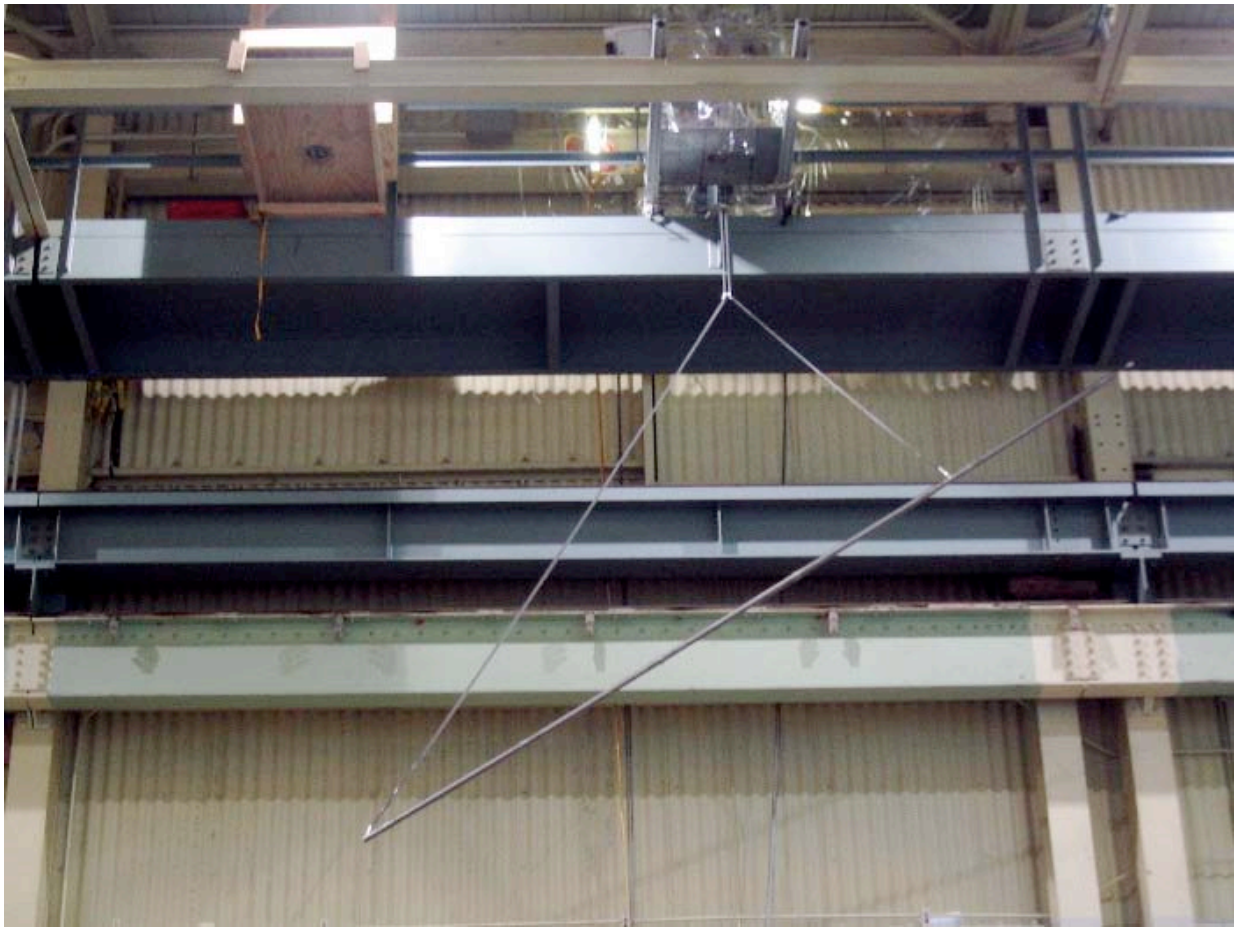
Emergency Recovery Options for the 4pi System



How can we retract the system from any state in the detector?

Emergency Recovery Options for the 4pi System



Recovery may require raising or lowering of cables!

Failure Modes and Actions

1. Control Failures

Power Outage

⇒ UPS ⇒ Computer and software recovery

Computer Crash

⇒ restart computer ⇒ restart controls ⇒ read last position from database ⇒ move system back into neutral position ⇒ tare system

Software Crash

⇒ restart controls ⇒ read last position from database ⇒ move system back into neutral position ⇒ tare system

-> Fred demonstrated robustness of system yesterday.

Failure Modes and Actions

2. Hardware Failures

Instrumentation Unit

⇒ move system back into neutral position using cable length measurements ⇒ retract pole ⇒ excange IU

Motor 2 or GearBox 2 (lower spool)

⇒ secure system and think!

⇒ retract pole using motor 1 (normal retraction)

⇒ lower cable 2 as needed

Motor 1 or GearBox 1 (upper spool)

⇒ secure system and think!

option 1: ⇒ retract pole using motor 2 (inverted retraction)

option 2: ⇒ manipulate both cables manually

What do you need for emergency recovery?

1. Securing the system with cable clamp √

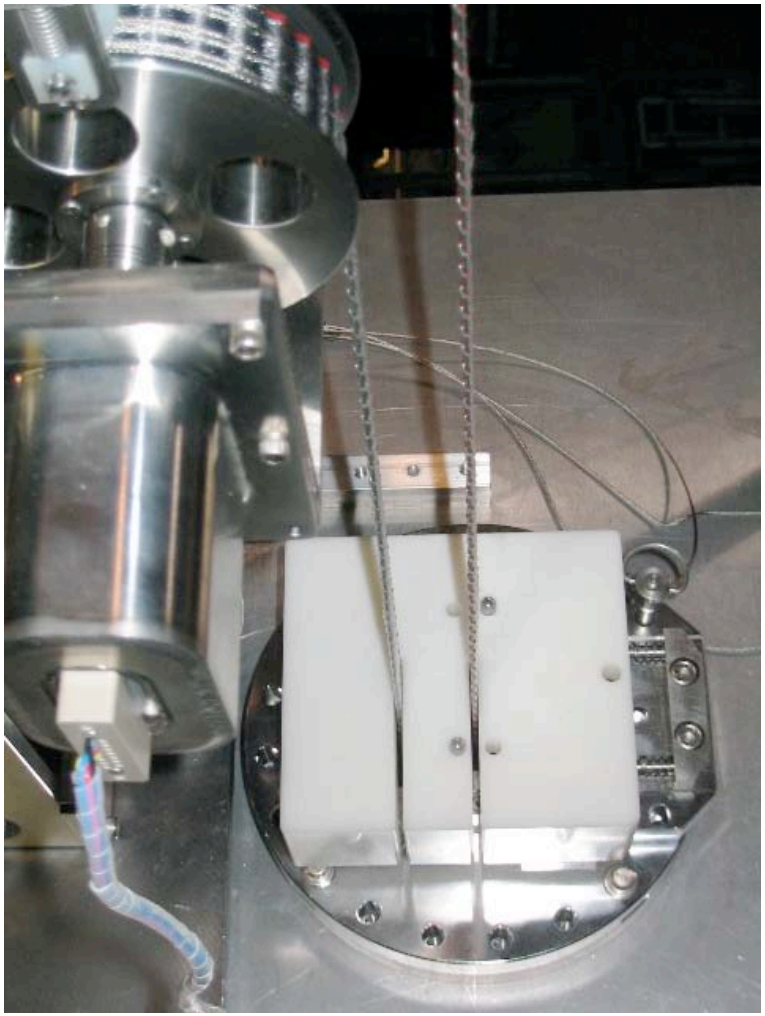
2. Software simulation for pole position:
   what happens if I raise or lower this cable? √

3. Method to raise cable. √

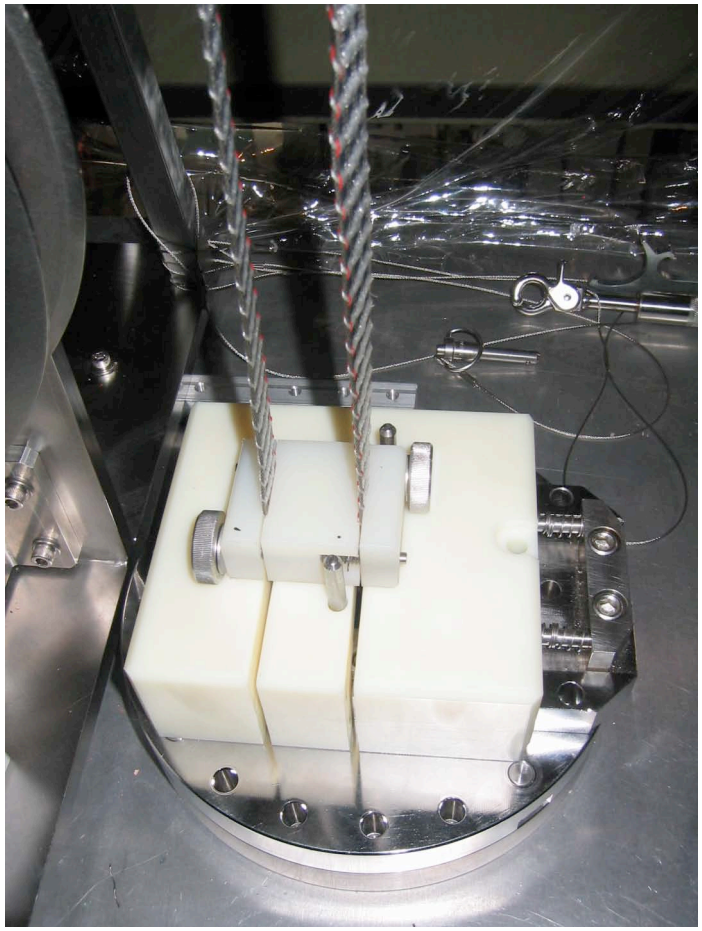
4. Method to lower cable. √

Securing the System

Normal Deployment



Emergency Locking Clamp



Software Simulation of Pole Position in Manual Mode

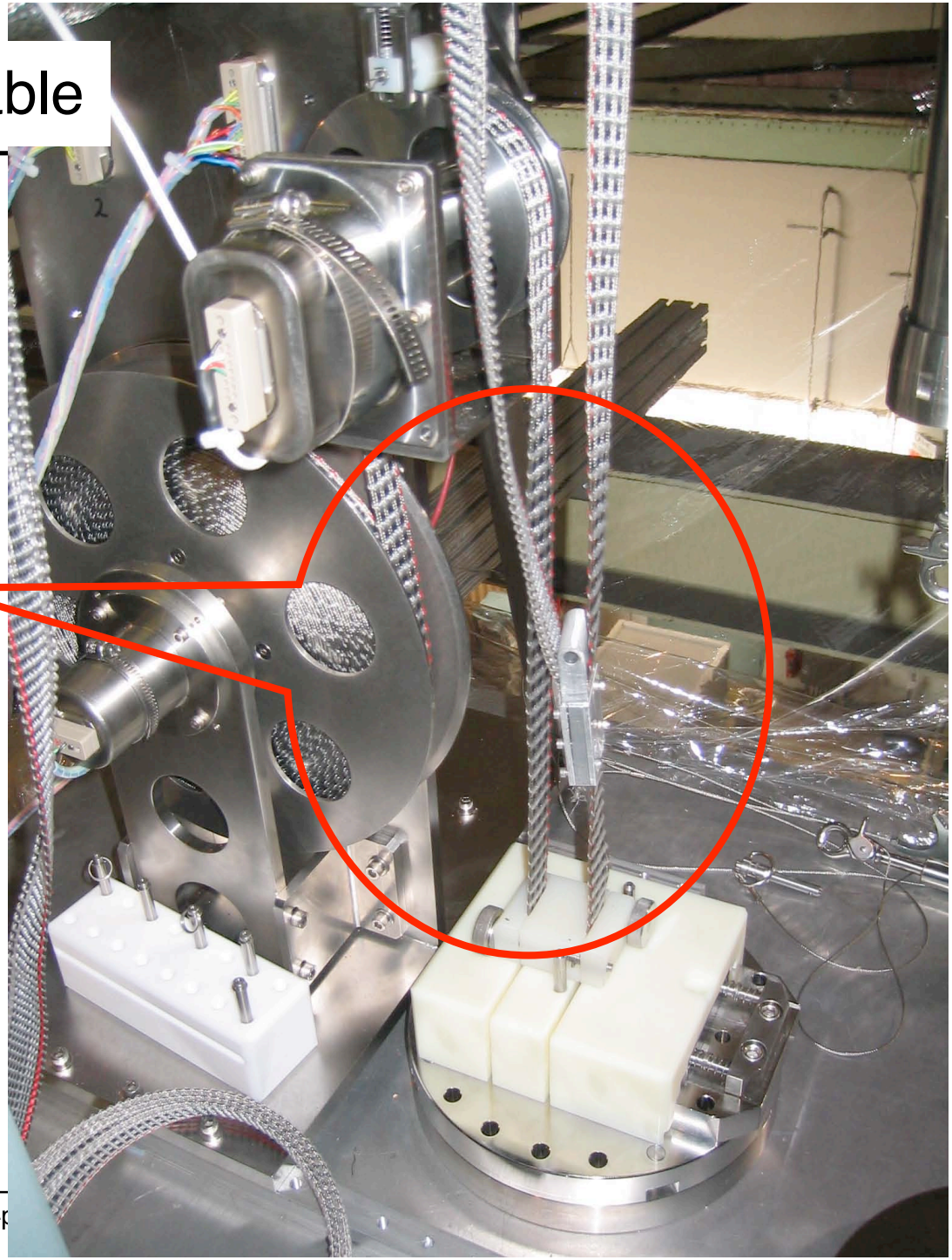
-> Run control program in simulated mode. (in place)

-> Proceed in small steps.

Method to Lower the Cable

Cannot unwind spools manually

Can use cable clamp to attach another cable



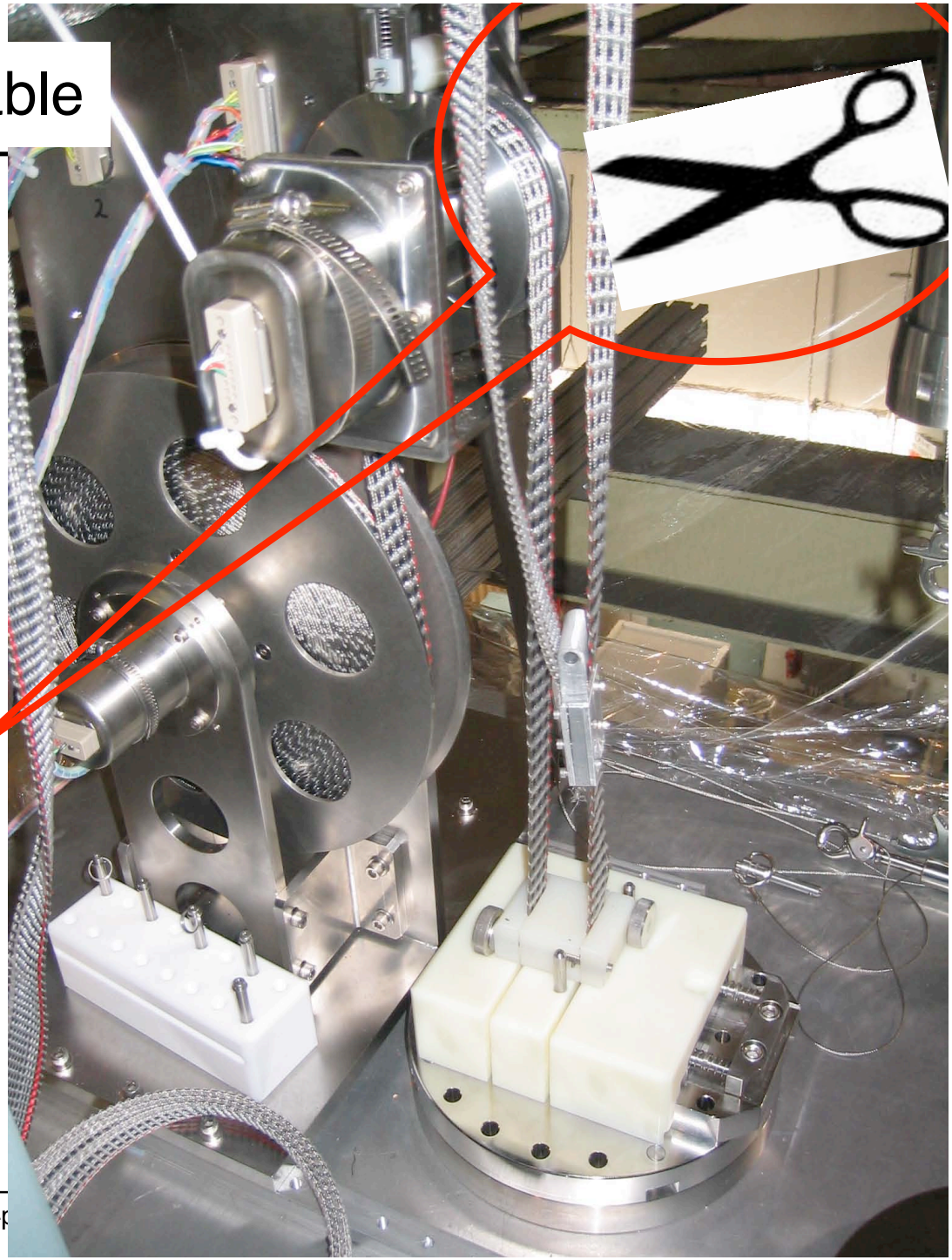
Method to Lower the Cable

Cannot unwind spools manually

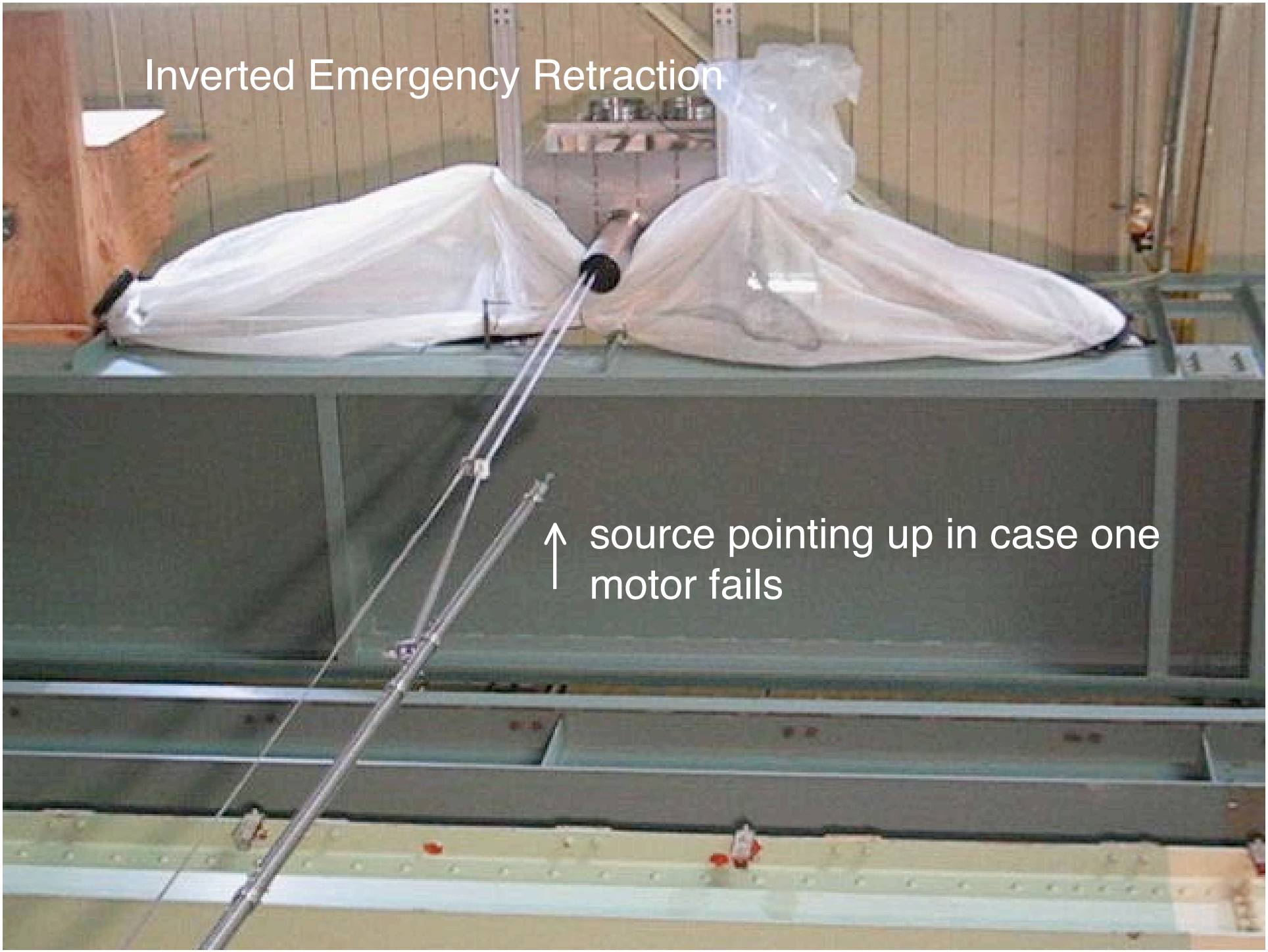
Can use cable clamp to attach another cable

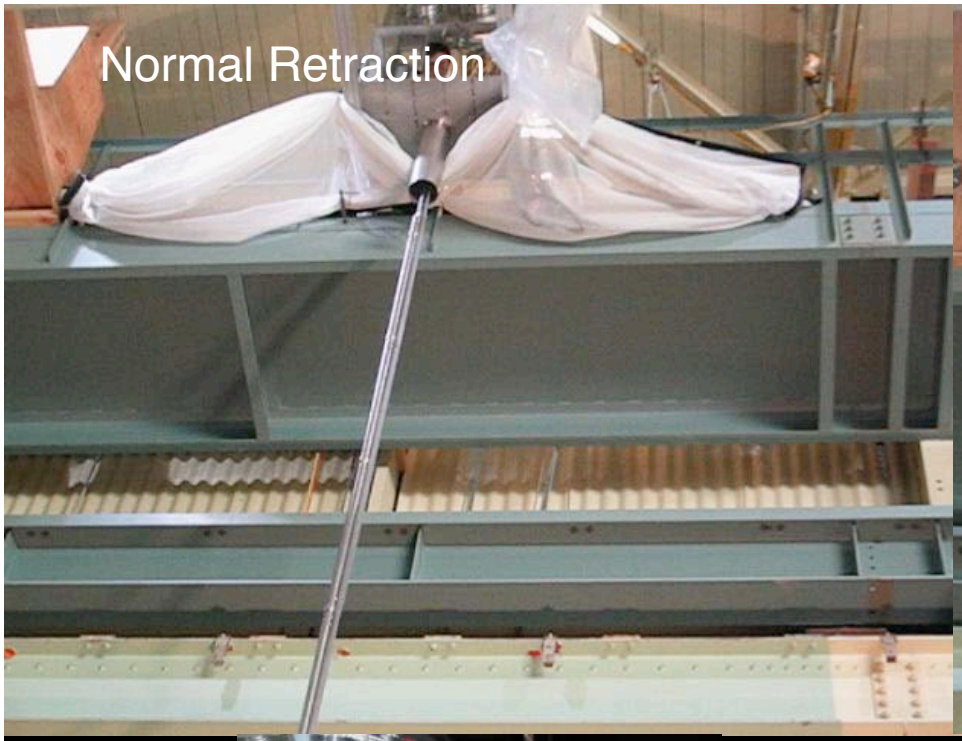
Cut cable connected to spool

-> Now we can manually lower cable.

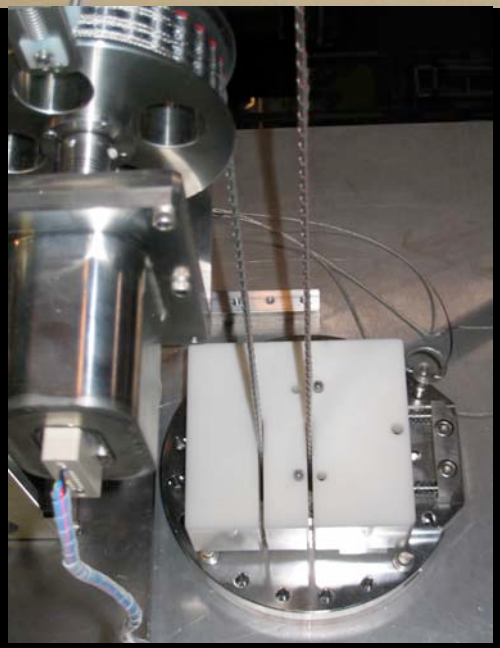


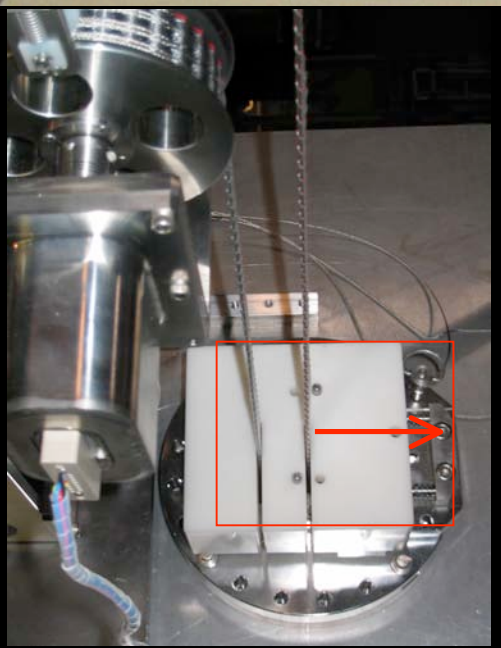

Normal Retraction
source pointing downwards for safety


Inverted Emergency Retraction
source pointing up in case one motor fails


Normal Retraction


Inverted Retraction






Inverted Emergency Retraction
Shift load
cable to left


Inverted Retraction

Summary

√ Easy recovery from power, software, or computer problems.

√ Software runs on several platforms with Java.

X Cannot exchange motors or gears without opening penthouse.

√ Have basic tools to manually raise or lower the cables.

√ Have software to simulate steps of manual operation.

We may want to think about better tools for manual operation but…

It is possible to manually retract the pole!

Suggestions & Comments

- Prepare cable clamps to move cables down in steps for each cable.

- One cable mark should always be visible in the glovebox. Will mark spools to estimate cable lengths.

[Note: if we cut cable we will loose information from IU!]

- When we attach a secondary cable can we lower the cable far enough to get the system back into neutral position without jamming the pivot block? Make a figure showing that we can attach a long enough secondary cable to lower pole into neutral position.

-What about twisting of rope? Demonstrate that we can move pole into neutral position when cable is twisted.

-Does the cable push the pole out of the center position?